

AMATEUR SATELLITE REPORT

AMSAT's Newsletter for the Amateur Space Program.



Amateur Satellite Report is endorsed by the American Radio Relay League as the special interest Newsletter serving the Amateur Radio Satellite Community

Number 83
July 30, 1984

Editor: Vern Riportella, WA2LQQ
Contr. Editor: George Johnson, W0MD
Harold Winard, KB2M
Managing Editor: Bob Myers, W1XT

Copyright 1984 by Amateur Satellite Report
(See last page for details)

AO-10 Schedule Overhaul Tied to Eclipses, Service Upgrade

In the first major overhaul of the AO-10 operating schedule since the satellite transponders were first placed in service 6 Aug. 83, AMSAT technical planners have revealed plans for significant improvements.

The improvements affect the General Beacon and both Mode L and Mode B transponders. The revisions are expected to be implemented in early August. Improvement in the General Beacon involves upgrades in schedule, content and currency while the transponder operating schedule will be thoroughly revised.

According to Engineering Vice President Jan King, W3GEY, the changes are an effort to respond to a number of complex scenarios including the onset of a major eclipse season, the longest seen by AO-10 to date, beginning in early September. (See accompanying graphs.) Other factors contributing to the overall plan included the strong desire to improve the usefulness of the beacon, communicate more and varied data on it, accommodate Mode L users and encourage further inroads there. W3GEY pointed out to ASR that these and other objectives have to be accomplished within "some rather stringent engineering constraints."

The plan to upgrade AO-10 service comes as one of a series of major decisions resulting from a meeting of distinguished technical leaders who met recently in England. (See ASR #82 for a preliminary report by G3YJO.) Meeting there the first week of July, the group developed consensus views on topics ranging from AO-10 to Phase IIIC, PAC-SAT, Phase IV and more. More on these other topics soon.

Details of the AO-10 planned improvements as presented to ASR by W3GEY are as described below. W3GEY cautions that a bit of fine-tuning and tweaking will be necessary pending the result of sun-angle studies.

Beginning in August the General Beacon (145.810 MHz) will begin a round-robin program of CW, RTTY and PSK telemetry designed to provide virtually all key system operating conditions consistent with listeners' station sophistication. The more complex your station, the more information will be available to you. The operating schedule will be as follows:

0- 5 minutes past the hour	CW
5-15 " " " "	PSK

15-20 "	"	"	"	RTTY
20-30 "	"	"	"	PSK
30-35 "	"	"	"	CW
35-45 "	"	"	"	PSK
45-50 "	"	"	"	RTTY
50-60 "	"	"	"	PSK

CW transmission speed will be about the same as the present. The RTTY format will be 50 baud, 170 Hz shift. ASR is told a machine which copies standard 45.45 baud (60 wpm) baudot will copy AO-10 RTTY OK. The PSK telemetry will be the same as has always been used (400 baud). W3GEY says a serious effort will be made to make information and perhaps hardware available for stations that wish to copy the PSK telemetry. A computer will be required and a substantial homebrew software development effort may be required to develop the interface, however.

The format of the CW message will be a simple two-part standard: header and text. The header will be composed of 4 elements: 1. AGC level; 2. MA (Mean Anomaly in units of 1/256 orbit); 3. Message serial number; 4. Spacecraft identifier, ie, AO-10. The header will be followed by a text message of varying content. The entire message, header and text, will be enveloped by the 5 minute limit.

The RTTY format will contain all of the CW bulletin information. In addition, however, it will also contain the telemetry "Y-blocks" which reveal much about the AO-10 operating conditions. The values are expressed in standard engineering units. For example, milliamps, volts, degrees, etc.

The PSK format may be tweaked a bit but there are no details yet available on the nature or magnitude of PSK telemetry changes.

W3GEY indicates that specific user-oriented features will be included as operator aids. Such features would logically include Keplerian elements for AO-10, he suggests. Suggestions as to what other operating aids might be included are solicited. Suggestions may be forwarded to AMSAT HQ.

Plans for the new transponder schedule, according to King, had to account for seasonal changes in sun angle as well as the eclipses. These factors drive the overall spacecraft attitude calculations which in turn dictate transponder schedule. Also figured in are the interesting and complex relations between power consumption (Mode L consumes much less than Mode B because of its lower than expected sensitivity) and antenna beam pattern. The Mode

B pattern is much more tolerant of off-pointing than is the Mode L system. King explained that formerly the bore-sight angle of the satellite was zero (dead-on) when the satellite was at apogee. Now, however, the sun angle dictates off-pointing of apogee. The solar cells produce most power when the sun is normal (perpendicular to) the plane of the solar panels. With the changing seasons, the angle must be adjusted. Above all of course, the power budget must remain positive. That means that for a given period of time (measured in time scales of an orbit or two) the available battery energy must be non-negative. Since recoverable battery power is less than what you put into it (there is always some loss to heat and other subtle effects) the batteries must see a net positive influx of energy on the time scales depicted.

W3GEY points out that since Mode B is a strong consumer of power, Mode L can be viewed as a low power mode analogous to Mode C on AO-7 and that off-times should be scheduled to maximize energy capture and storage.

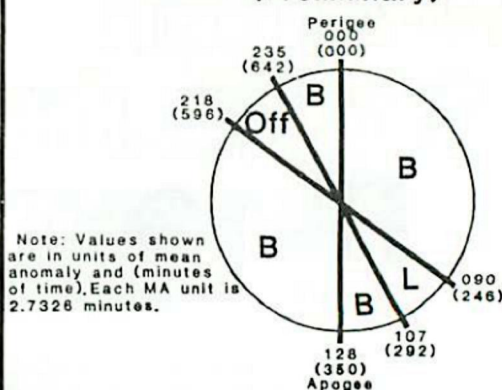
The plan/schedule which results is shown below. King advises that some fine tuning will be necessary but that the overall scheme of things will be as depicted.

Notes: Anomalistic period (time between successive perigees) is 699.536283 min. One "MA tick" is the period divided by 256, ie, 2.7325636 minutes. Onset of Mode L will be subject to refinement. Exact value will be announced. Recharge time will be 128 MA ticks after Mode L onset and be about 16 ticks long.

The General Beacon update will occur about weekly. This is made possible in part by the fact of four new command stations having been qualified recently. They are VE1SAT/VE6, KA9Q, DK1KQ and ZL1AOX. All attended a special seminar at Marburg, West Germany (Headquarters of AMSAT DL) following the meeting in England. The new command stations will be taking up their duties soon.

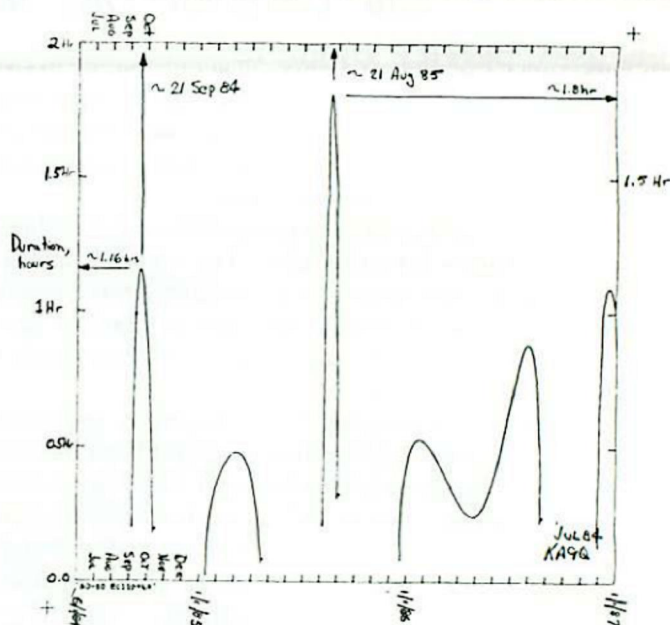
The maximum eclipse this year will be about 70 minutes long and will occur on about 1 Oct. Next year an even more severe eclipse period will occur when on about 20 Aug. a 105 minute eclipse is predicted. KA9Q is developing a profile of the eclipse cycles to be fed into the analysis process which determines the energy budget.

AO-10 Transponder Operating Schedule (Preliminary)



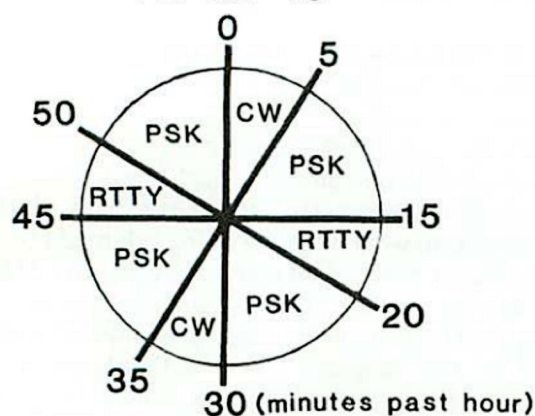
Effective August 84

WA2LQQ JUL 84



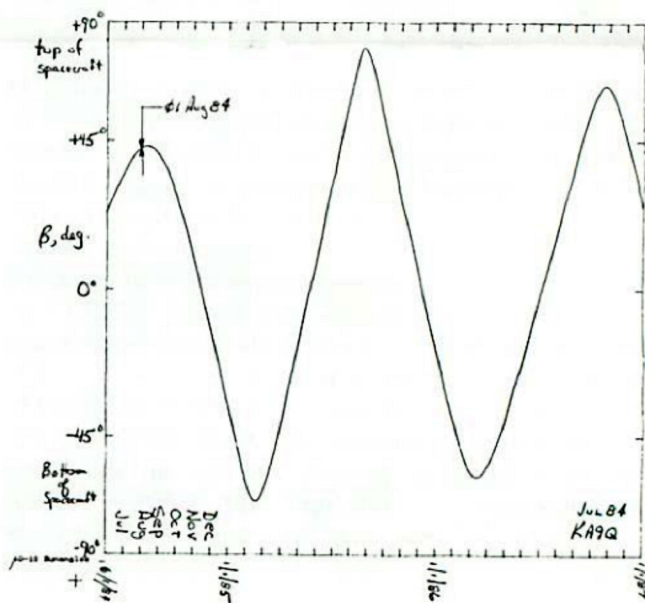
Computer plot shows AO-10 eclipses. Duration and schedule are shown. Analysis by KA9Q.

General Beacon Operating Schedule For AO-10



Effective August 84

WA2LQQ JUL 84



Computer plot shows sun angle to AO-10. By KA9Q.

Northwestern Division ARRL Convention Includes Space Features

The Northwestern Division ARRL Convention held in Seaside, Oregon 1, 2 and 3 June featured several highly recognizable amateurs in a distinctly "spacey" theme throughout. Roy Neal, K6DUE, gave the banquet talk. The subject was future Space Shuttle "Ham-In-Space" plans. Roy, who was instrumental in Owen Garriot's STS-9 premier as a "Ham-In-Space" last Autumn, presented Lance Collister, WA1JXN, with the QSL for the first QSO with W5LFL.

Over 3500 attended the convention according to Area Coordinator, Dave Barnard, W7LSV, who manned the AMSAT booth with help from Joe, W7TYN and Dave, WA7VKC.

Speakers provided interesting talks on a variety of topics. Of particular interest to OSCAR and VHF/UHF enthusiasts were talks by Tim Pettis, KL7WE on antenna design and testing, Lance Collister, WA1JXN, on getting started in EME and Bob Herndon, W7XN, on OSCAR. W7XN's talk was characterized as a practical presentation that was interesting and well-received by both the experienced and novice satellite users according to W7LSV.

Hams from Montana, Idaho, Alaska, Washington, California, British Columbia and Oregon made up the bulk of attendees. Many AO-10 acquaintances met at the AMSAT booth to exchange greetings and stories.

W7LSV remarks on the value of establishing and staffing an AMSAT booth with local support. He says it's "an excellent way of getting to know fellow satellite enthusiasts in person while helping the AMSAT program! What most impressed a number of visitors was the fact that the AMSAT booth was not manned by the folks from back East but was the result of local effort! Many people [erroneously]



Larry Price, W4RA, President of ARRL, and Lance Collister, WA1JXN, at the ARRL Northwestern Division Convention.



Lance Collister, WA1JXN, and Roy Neal, K6DUE, at the ARRL Convention.

assume AMSAT has the office staff to be everywhere and do everything." Dave goes on to point out that Area Coordinators, with the help and support of local folks can often organize a very significant effort. He says that local support is essential to building a balanced organization with strong leadership on the one hand and strong grass-roots support on the other.

The Oregon State Convention is held annually. On alternate years it is the basis of the ARRL Division Convention. AMSAT congratulates Area Coordinator Dave Barnard, W7LSV of Tualatin, Oregon, for his initiative and insight and for inoculating the Northwest with his enthusiasm. Thanks as well to W7TYN, WA7VKC and to all those who made the event a success including K6DUE!

AMTOR Debuts On AO-10

What is claimed to be the first AMTOR QSO on AO-10 came, according to 9M2CR, on 2 Mar. 84 when he and DC8AM QSOed on orbit 540. It worked perfectly but the question is "Why?"

AMTOR has stringent timing requirements. A short sequence of characters is sent by one station. It then waits for an acknowledgement. The timing of the transmission and acknowledgement is precise. The delays involved in AO-10 would seem to preclude use of AMTOR.

But what Colin, 9M2CR and his contact, Horst, DC8AM found at 0140 UTC on March 2 was that the propagation delay for the stations involved with AO-10 near apogee having sub-satellite point of 23N, 267W was just right for AMTOR because the "handshake" control signals were slewed "neatly one time-frame [later]." The total roundtrip propagation delay of about 500 milliseconds compares favorably with with 3-character block time of 450 milliseconds, says 9M2CR.

However, when errors cause retransmission, the delays involved cause a double retransmission.

Colin is quite pleased with the results of his early tests. Tests with YB0AQT have shown most errors are caused by local 2 meter QRM.

AMTOR is a digital communications mode between RTTY and packet in complexity and efficacy. Like packet, it pro-

vides virtually error-free copy because of the ACK/NAK (acknowledge/not acknowledge) feature which prompts immediate retransmission of the lost characters. Like RTTY, AMTOR is a slow mode designed to be used over HF channels where vagaries of propagation fading (primarily due to multi-path effects) are significant.

With the introduction of AMTOR to the AO-10 venue, it joins other modes such as SSTV, RTTY, packet as well as SSB and CW on the bird.

Annual Meeting Place, Date Set

Special to ASR by W6SP, Chairman

The Second Annual AMSAT Technical Symposium and the 1984 Annual Membership Meeting have been firmly scheduled for Saturday 10 November 1984. The specific day was selected following careful consideration of all available individual preference comments.

The location will be the Amfac (formerly Airport Marina) Hotel at the corner of Lincoln and Manchester, on the north side of Los Angeles International Airport (LAX). The address is 8601 Lincoln Blvd., Los Angeles, Ca 90045. Telephone: (213) 670-8111. The Amfac provides the following amenities: Free van service from LAX scheduled each ten minutes; 24-hour restaurant and cocktail lounge; ample free parking; golf and tennis across the street; exercise facilities and swimming pool; numerous meeting rooms; catering arrangements; 750 rooms and 7 suites. Prices are moderate and major credit cards are accepted. A block of "corporate rate" rooms has been set aside for AMSAT use. Room reservations should be made directly with the hotel.

Facilities Chairman is Dennis Dinga, N6DD. Dennis will be handling arrangements for the planned luncheon and dinner on the day of the meeting. His address is P.O. Box

4111, Diamond Bar, CA 91765.

Dr. Cleyon Yowell, AD6P will serve as Symposium Technical Chairman. A call for papers has been issued. Submissions should be sent to Cleyon at: The Aerospace Corporation, Mail Station M4-930, P.O. Box 92957, Los Angeles, CA 90009. His telephone is (213) 615-4234.

Short Bursts

- Ohio's Area Coordinator corp continues its path to leading the nation in terms of breadth and depth. Newest additions announced by W0CY and W8PGP are: WA8RYD, Jerome F. Marchal, Assistant Area Coordinator for Southern Ohio (Cincinnati District); N8ATB, Joseph H. Berman, Assistant Area Coordinator for Southern Ohio (Athens District). Congratulations to the new appointees! W0CY is Chief Area Coordinator and W8PGP is Area Coordinator for Southern Ohio.

- It is with deep sadness that we report the passing of Dean Morrison, W0TT, on Sunday, 8 July, at a hospital in North Kansas City, MO. He was 57. A Kansas City resident most of his life, Dean died suddenly. An AMSAT Life Member, Dean had filled in on the Mid-America (75 meter) Net the Tuesday before his untimely death. He was also a ARRL Life Member and was a TAPR member. Our sympathies to his family and we share the grief of his numerous OSCAR-friends the world over. W0TT SK.

- The ARRL National Convention was held in New York City 20-22 July. Presenting at the several AMSAT forums were N2CF, KO5I, KB2M, KA9Q and WA2LQQ. Helping at the booth were K2UBC, WA2LJM and KA1M. Certificates of Merit for helping to get the STS-9 W5LFL mission going were awarded to W3XO and WA2LQQ. Not present for their awards were W3IWI, W4PUJ. Details and photos next time.